



ORIGINAL ARTICLE

Biological Attributes of Lac Insect (*Kerria lacca*) in Tropical Conditions

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ABSTRACT

The lac is resinous secretion of lac insects which has great importance in several industries and also used sometime as medicine. The common lac insect (*Kerria lacca*) adheres to soft plant twigs and branches to complete their life cycle in not more than 3 months. This investigation was carried to study their biology in tropical regions like India to enhance productivity.

Key words: Biological Attributes, *Kerria lacca*, Tropical Conditions

INTRODUCTION

The "Lac" is secreted resin of lac insect (*Kerria lacca*) belongs to order Hemiptera and family Coccidae feeds upon plant sap during life cycle. Their reference is cited in Atharvaveda as 'Laksha' with short communication on its nature and behavior, and, also in 'Mahabharat' where Kauravas used 'Lakshagrih' to kill 'pandavas'. There is also instances in Aine Akbari' written by Akbar about contemporary use of lac as lac dyes and wax. The Vedic culture known about its secretion from insect with chemical and biological aspects of lac industry. Lac is single commercial resin from animal and insect secretion consist a mixture of resin, dye and wax, which is dried in open air. Its application is wide as cosmetic industry, food products and decorative items to life saving medicine.

The lac presently assumed relevant as an eco-friendly, biodegradable and self-sustaining natural product. The India is major country of lac production in the world. The host plants present in wasteland areas, so enhancement of lac culture can help in ecosystem stratification and also high economic returns. It is a source of livelihood of tribal and poor inhabiting forest and sub-forest areas.

LAC INSECT

This insect kept under order Hemiptera and family Coccidae which first study reported by Tachard (1710) and detail by Kerr (1782) who named as *Coccus lacca*. Its genus was considered as Laccifer by Oken (1815) and nomenclature as *Kerria lacca* by Blanche (1883).

There is 9 genera and 89 species are represented worldwide in which 3 genera and 13 species are reported in Bihar (Sharma and Ramani, 2011; Table 1).

Table 1: Lac species distribution in Bihar and other states

S No.	Species	Distribution
1.	<i>Kerria lacca</i> (Kerr)	Bihar, UP, WB, Odisha etc
2	<i>K. albizziae</i> (Green)	Bihar, WB, Uttrakhand
3	<i>K. meridionalis</i> (Chamberlin)	Bihar
4	<i>K. nepalensis</i> (Varshney)	Bihar
5	<i>K. fici</i> (Green)	Bihar, UP, WB, MP, Rajasthan
6	<i>K. pusana</i> (Mishra)	Bihar
7	<i>K. sindica</i> (Mehadi hassan)	Bihar

The family Coccidae includes all scale insects ranged from virtually microscopic to quite more than 2-3 cm in size. These insects adhere themselves in massive numbers to host plants. Its mouth part is combination of half piercing and half sucking type. They will be extremely harmful to tree-

stunting or killing twigs and branches by exhausting the cell sap. There are nine genera of insects out of that solely five secrete animal product and only one *i.e. Kerria lacca* secretes industrial type product. The general and most common species of lac insect in India is *Kerria lacca* (Kerr) which produces that is basis of lac industry.

DISTRIBUTION

The distribution of insect resin scattered in Southeast Asian regions as insects thrive and feed on the tropical soft trees, however, conjointly reported in sub-tropical regions from earth equator (Varshney, 1976). India has first position in reference to insect product as lac. There 90% of lac cultivated in the north-eastern states and only 10% from wild regions of UP and Himachal Pradesh.

LIFE CYCLE

The life cycle of insect starts with crawler as its first larval stage as soft, oval shaped body, tapering on posterior side of abdomen. It is 0.6mm long from head to abdomen and 0.25 mm broad at thorax and abdomen. The head carries a pair of antennae, a pair of ocelli and ventrally the mouthparts. Ten antenna is six segmented including basal one. On ventral side of the thorax are situated two pairs of spiracles. Abdomen is 8-9 segmented and last few are telescopic. The last segment of the abdomen forms the anal ring carrying a pair of greatly elongated setae, in addition to three shorter pairs arranged round the anal opening.

The first instar is mobile and it crawls over the shoot of host trees. It has piercing and sucking type of mouthparts. It feeds on phloem sap by piercing its proboscis into the phloem region of shoots. The lac crawler starts secreting resin in minute quantity after 2-3 days of settlement. Except three body openings, the lac insect covers itself completely by its secretion the lac resin. The three openings are, anal tubercle and respiratory pores. To avoid covering of these holes by resin, the lac insect secretes wax, which is white thread like structure. Normally 200-300 young lac insect crawlers settle in one square inch area. The male and female insect can't be distinguished at this stage.

Male insect is red in color and measures 1-1.4 mm in length. The body is divisible into head, thorax and abdomen, however, not distinct demarcation present. The head bears one pair antenna, a pair of false eye or ocelli on the ventral position to the mouth. The legs are segmented into coxa, trochanter, femur, tebea, tarsus and claw. It has reduced eyes and antennae. Thorax bears single pair of hyaline wings in males. The sexually matured female lac insect is a disc like structure (fig.1).

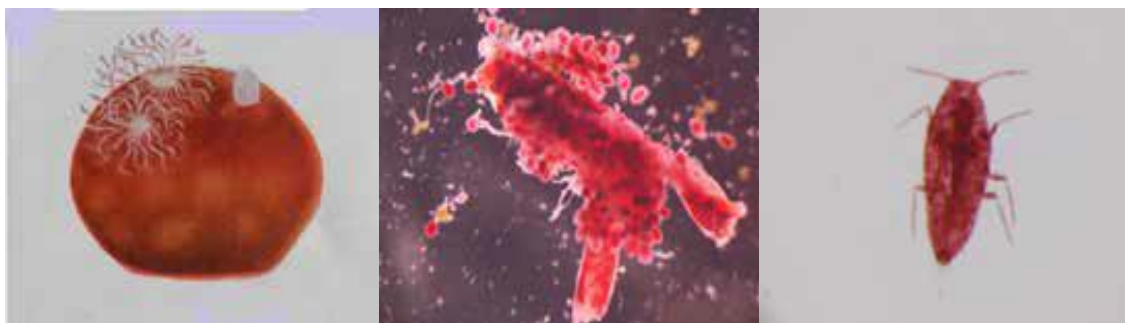


Fig. 1: Female lac insect, developing egg cells and Crawler stage

The female insect continuously grows to attain larger size than male measures 4-5 mm in length and incorporates a pyriform body. The head, thorax and abdomen are not clearly distinct. The antennae and legs are degenerated due to limited and random growth with absence of wings. Thus, the body part adhered with host plant is oral and aboral side consist branchia, dorsal spin and anal tubercle. The remaining body is roofed with thick resin which helps in insect attachment on host plant. This resinous covering has two spiracles and single pair of anal tubercle consist excretory and reproductive pores.

The Life cycle of insect takes six to eight months and consists egg, nymph instars and adult stages. The insects have associated ovoviviparous mode of reproduction. Female lays 300-1000 already hatched eggs taking only short period in emergent crimson-red first nymph as *Crawlers*. This period of crawler (0.6 x .25 mm) emergence is popular as swarming continues to about 5 weeks.

The nymph once settles on soft twig than begins ingestion of the plant sap. The population of the insect on host plant distributed as 300 insects/ per square inch and they start to secreting resin from their lac glands of the body after next day. This resin is semi-solid that hardens in contact of air into a protective covering. The nymphs molt thrice within this cover (cells) prior to reaching maturity. The duration of each instar is dependent on several factors *viz.* temperature, humidity and host plant. A general average developmental period is as follows in table 2.

Table 2: Average development time of Bivoltine lac strain in India

Strain	Crop	Larva (week after inoculation)	Male (week after inoculation)
Kusmi	Jethawi	23-25	10-12
	Aghani	27-29	7-8
Rangeeni	Katki	15-17	6-7
	Baisakhi	35-37	12-16

(Source: Jaiswal and Sharma, 2011)

Both the male and female nymph loss their appendages, eye in first molt and become degenerate. The insect grows within the cell or cover and simultaneously molted into adults after 8 weeks period. The male insect exhibit total metamorphosis and serially changes into different nymphal instar, pupa and finally to adult with clarified antennae, legs and a single pair of wings. The winged adult male mated to females and fertilizes them.

The female insect retains her mouth parts but fails to develop any wings, eyes or appendages. While developing, it really becomes an immobile organism with little resemblance to an insect. Females become little more than egg producing organisms. The female insect become larger to adjust her eggs, and, resin secretion from body stands for several layers around body and shrinks their size to leave the cells for the eggs. The matured females are identified with two initial yellow spots at margins which later enlarges and changes into orange spots. Thereafter, the female laying eggs in the space named as Ovisac. The ovisac appears orange due to fluid-like dye showed resemblance to cochineal indicates egg hatching in a single week period. The larvae exits and the total process again repeated once again. The encrusted branches are harvested after one cycle and sometime when the next generation starts to emergence. They are scraped off, dried and processed for various lac products. A portion of brood lac is retained from the previous crop for the purpose of inoculation to new tree.

REFERENCE

1. Jaiswal A.K. and Sharma K. (2011): Lac insect, its development and life cycle. *In* Sharma, K.K. and Ramani, R. (eds) Recent advances in lac culture. 22-26 pp.
2. Sharma and Ramani (2011): Lac insect systematics and geographical distribution. *In* Sharma, KK and Ramani R (eds) Recent advances in lac culture. 27-36 pp.
3. Varshney R.K. (1976): A check list of insect parasites associated with lac. *Oriental Insects*. 10: 55-78.